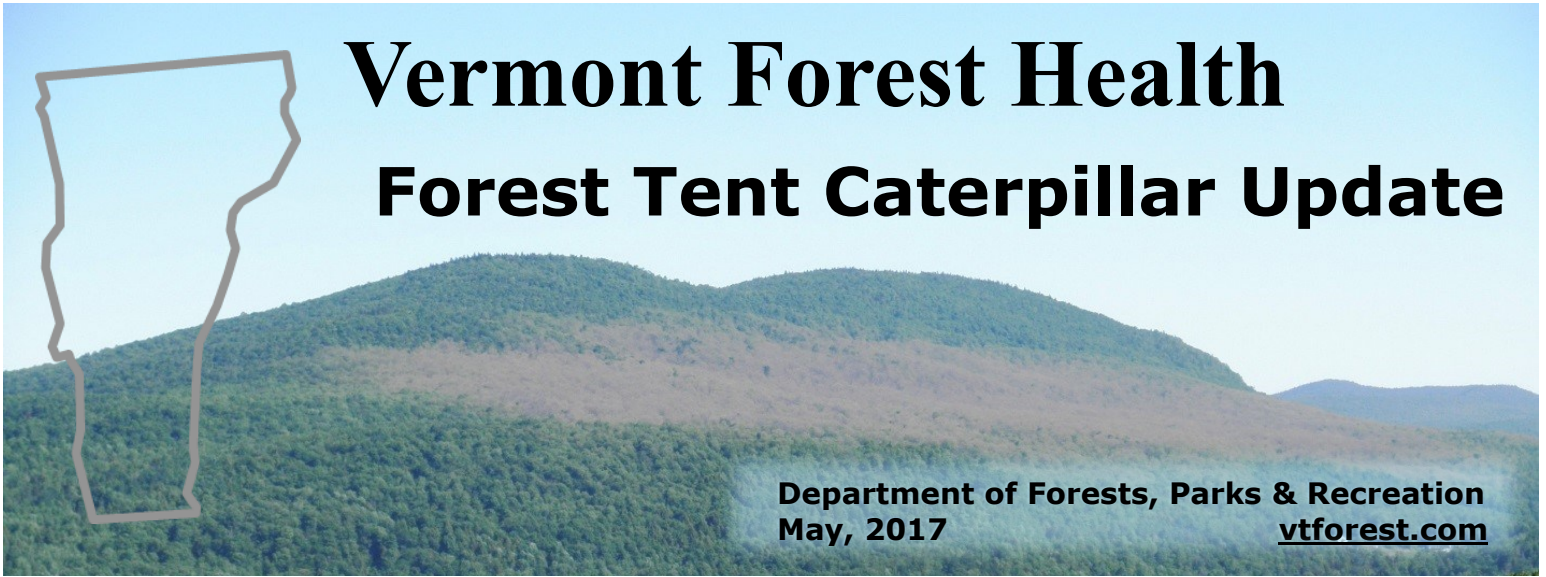


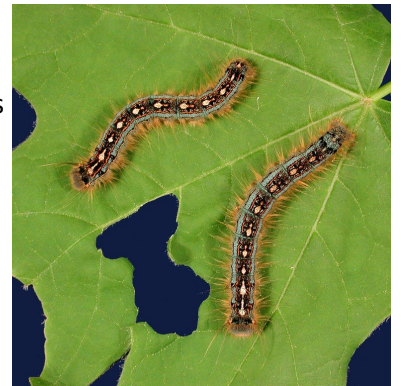
Vermont Forest Health

Forest Tent Caterpillar Update



Department of Forests, Parks & Recreation
May, 2017 vtforest.com

A Forest Tent Caterpillar outbreak is underway in Vermont. In 2016, approximately 24,500 acres of defoliation were mapped during statewide aerial surveys. The area of heaviest defoliation included parts of Essex, Lamoille, Orleans, and Caledonia Counties. Forest tent caterpillar is a native insect, and part of our hardwood ecosystem. Most trees will recover, but defoliation is a stress on affected trees and can incite tree decline if other stresses are present. This leaflet describes the current status of forest tent caterpillar, and provides management information for sugar makers, forest land managers, and others concerned about protecting tree health.

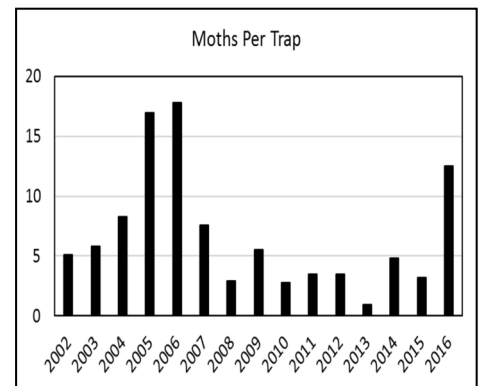


Forest tent caterpillar is a native insect.

Hosts and Current Status

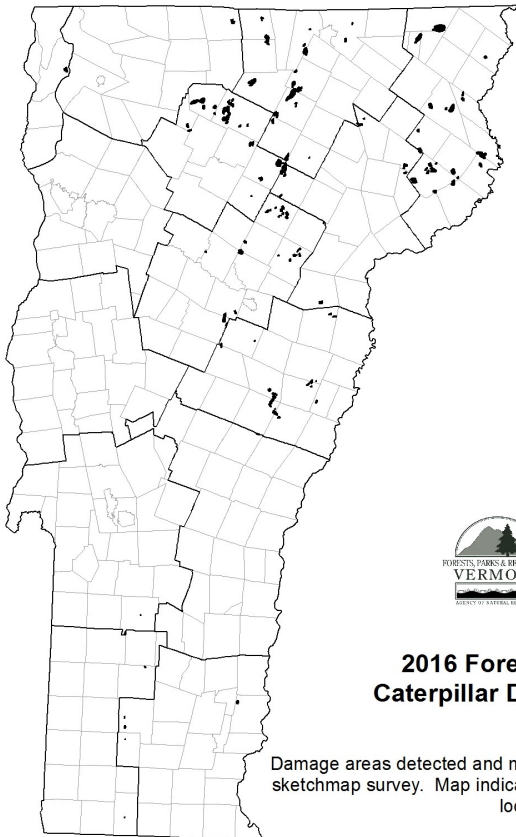
The species most commonly defoliated in Vermont are sugar maple and white ash, but forest tent caterpillar will feed on most deciduous species. Red maple is not a host.

The moth trap catch increased dramatically in 2016, indicating that defoliation will be more extensive in 2017.



If this outbreak follows previous trends, we expect defoliation to be more widespread in 2017. Moth catch in pheromone traps in 2016 increased four-fold from 2015, with the statewide average trap catch in double digits for the first time since 2006, the peak of our most recent outbreak.

Over the winter, VTFPR conducted egg mass surveys in 64 sugar-bushes (representing more than 10,200 acres) to predict the level of defoliation that could occur in 2017. Of the area surveyed, approximately 5,000 acres at 32 locations were identified as at risk of defoliation.



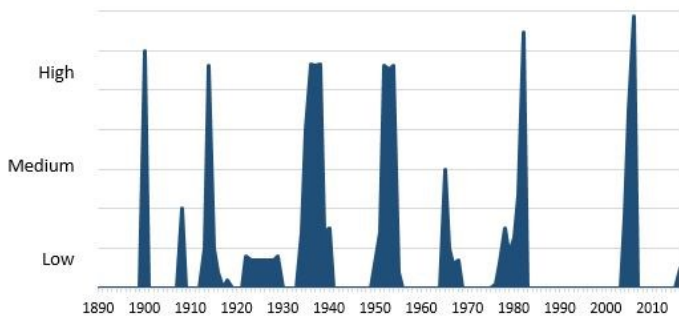
2016 Forest Tent Caterpillar Defoliation

Damage areas detected and mapped by aerial sketchmap survey. Map indicates approximate location of damage



In 2016, approximately 24,500 acres of defoliation were mapped during aerial surveys. (Defoliated area not to scale. Data includes survey information from the U.S. Forest Service, Forest Health Protection)

VT Forest Tent Caterpillar Defoliation: 1890 - 2016



Outbreaks have occurred periodically in Vermont, and generally last 2-6 years.

Life Cycle

Forest tent caterpillars emerge from eggs, over several weeks, when sugar maple leaves unfold. More information on the timing of caterpillar emergence and sugar maple leaf expansion, based on our VT monitoring sites, can be found at: http://fpr.vermont.gov/forest/forest_health.

Young caterpillars can spread by “ballooning” from long threads. They molt four times as they grow, leaving cast skins behind. Defoliation increases quickly when they are large.

Feeding is complete by early July. When about 2” long, the caterpillars pupate inside white cocoons, usually within rolled up leaves. Moths emerge about two weeks later. They mate and lay eggs on twigs, preferably on upper branches, in masses of 150-200 eggs. Embryos inside the eggs develop quickly and consume carbohydrates throughout the winter.

Between outbreaks, natural enemies including birds, spiders and parasitic insects keep populations in check. (With the exception of cuckoos, most birds only eat the innards.) Outbreaks occur when caterpillar growth outpaces natural enemies, such as during early warm springs. Populations build up more quickly where sugar maple and ash predominate, and in stands which have been recently thinned. In these open forests, caterpillar diseases spread slowly, and parasitic insects are vulnerable to predation.

Outbreaks collapse from a combination of factors: starvation, malnutrition from eating less-preferred tree species, viral or fungal diseases, and high rates of parasitism. Parasitic insects increase in numbers, including the friendly fly, which lays eggs on cocoons. Outbreaks may also collapse if eggs hatch early and cold temperatures delay bud development, or if there is a late spring frost. Winters are rarely cold enough to affect survival.

The forest tent caterpillar populations fluctuate between extremes, reaching outbreak proportions every six to 16 years. Typically, an outbreak may begin at a handful of sites, with the area increasing as insects disperse. That means that while populations may be declining in one area, they will be expanding in another.

Caterpillars emerge from egg masses in spring when sugar maple leaves unfold.



The white cocoons are mostly found in rolled leaves (arrow). Moths prefer to lay eggs on upper branch twigs. (Center: M. Isselhardt, UVM Ext.)

Outbreaks collapse due to starvation, diseases, or parasitic insects such as the friendly fly.



Leaf fragments on the ground are a sign of defoliator activity. In May and June, look for masses of caterpillars. (Right: E. Schadler, UVM Ext.)

What to Look For

During May and June while caterpillars are active, listen for their droppings, look for leaf fragments on the ground, and for masses of caterpillars resting on the bark. In mid-late summer, look for rolled up green leaves with a white cocoon inside. After leaf drop, use binoculars to see egg masses on the twigs of upper branches.

Forest tent caterpillars do not make a tent! Tents seen in the spring in branch crotches of cherry or apple trees are made by the [eastern tent caterpillar](#). Webbing on the ends of branches later in summer is most likely [fall webworm](#).

Impact

Healthy hardwoods can survive several consecutive years of defoliation. Within a few weeks of heavy defoliation, trees refoliate. Buds that would normally have generated shoots the following spring expand and produce foliage. Then new buds are set.

Defoliation reduces a tree's ability to produce and store carbohydrates. This affects wood production, and the amount of foliage and shoot growth next year.

Other factors may contribute to the impact of defoliation. In 2016, summer was abnormally dry in most of the state. Lack of water reduced the success of refoilation. Defoliated areas remained noticeable all summer because new foliage expansion was reduced. Sometimes, tender refoiliated shoots withered, and leaves were scorched.

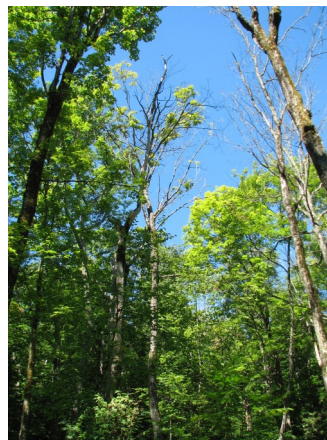
There is always a risk that defoliation could lead to dieback or even tree mortality. In addition to drought, consecutive years of defoliation, severe winters, and other disturbances magnify the impact. Extremely high caterpillar populations are another risk factor when they defoliate trees so quickly that caterpillars are still present and feeding when the refoilation emerges. After multiple defoliations, or if other stresses are present, food reserves may be depleted so that a tree's ability to survive the winter, defend itself from secondary pests, and maintain its living cells are impaired.

Maple trees on sites rich in calcium and magnesium are better able to recover from stress. Site factors that increase the risk of tree decline include acid soils, ridgetops, rocky ledges, or wet areas.

General Management Recommendations

- Maintain a diverse forest. Forest tent caterpillar avoids red maple and most conifers.
- Look for signs of forest tent caterpillar and defoliation. Assume that tree health has been affected if over half the foliage is missing.
- If trees were heavily defoliated, check after late July to make sure they have refoiliated, and that the new leaves are not stunted or brown.
- You can estimate the risk of defoliation next year by doing an [egg mass survey](#) once the leaves have dropped in the fall.
- Trees are resilient, but more caution is called for where summer was dry, if heavily defoliated trees didn't refoilate successfully, where trees were recently thinned, or if the site is less-than-optimal.

Assume tree health is affected if over half the leaf area is defoliated. Check to make sure that heavily defoliated trees refoilate by mid-summer (above right). Trees with stunted and/or brown refoilation (below right) are at greatest risk.



Multiple defoliations may lead to decline, especially in stands that were recently thinned, when accompanied by drought, following cold and snow-free winters, or on nutrient-poor sites.

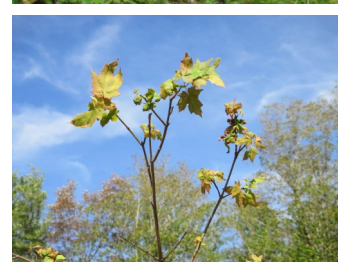
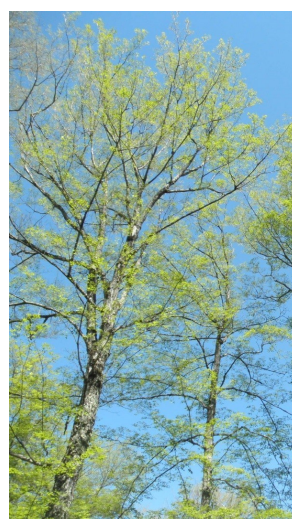
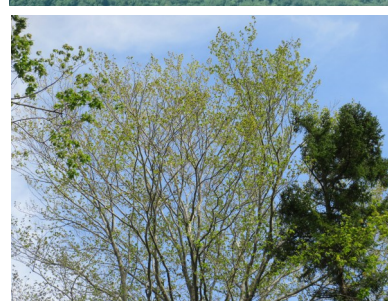
Trees should start to refoilate within a few weeks of heavy defoliation. (Photo: M. Isselhardt, UVM Ext.)



However, in 2016, defoliated areas remained visible throughout the summer because dry conditions reduced refoilation success.



Trees that were still defoliated in September had limited ability to replenish food reserves.



Sugarbush Management

Multiple defoliations are more likely in sugarbushes because they are dominated by sugar maple and their widely spaced trees increase caterpillar survival. In addition to the reduction in carbohydrate production, the decreased wood growth of defoliated trees reduces taphole closure and tapping sustainability. If defoliation has occurred, a minimum recommendation is to “tap conservatively” and delay thinning for 1-3 years. Consider not tapping small diameter trees, or with more than one tap regardless of diameter.

By request, the Department of Forests, Parks and Recreation will provide assistance in conducting egg mass surveys. Where defoliation is predicted and if trees were defoliated last year or if tree health is at risk due to other factors, sugar makers should consider the pros and cons of management alternatives. These include aerial insecticide treatment and leaving defoliated trees untapped next spring.

The only legal material for controlling caterpillars on maple that will be tapped for a food product is the biological insecticide Bt. The Bt formulation that is used to protect sugarbushes is OMRI (Organic Materials Review Institute) certified for use in organic production. In 2017, based on egg mass surveys, landowners arranged to have 18 sugarbushes treated, covering approximately 3,600 acres. Treatment is done in mid-late May after the eggs have hatched and maple foliage is expanded.

Even if a sugarbush is treated, some defoliation will occur. The caterpillars need to be actively feeding to eat the Bt. Aerial applications can be delayed by weather or other operational constraints, and there may be missed areas.

Timber Management

Postpone harvesting where forest tent caterpillar is building. By reducing the number of trees in the stand, thinning concentrates more insects on each remaining tree.

If a stand is defoliated, delay timber harvesting at least 3 years after the outbreak. In the short term, thinning allows soil to dry and disturbs roots. The delay also allows time for the impacts of defoliation to become apparent so the healthiest trees can be identified.

Unless there are significant additional concerns, we have not found it necessary to protect foliage of timberland trees.

Shade Trees

For those homeowners and arborists who want to protect the foliage of valuable shade trees or reduce nuisance caterpillars, we also recommend Bt. Large trees require specialized equipment.



Egg mass surveys help estimate the risk of defoliation next year.



Only Bt products may be used to treat active sugarbushes.

Citation: Vermont Dept. of Forests, Parks and Recreation. 2017. Forest Tent Caterpillar Update. Vermont Forest Health leaflet 2017-02. 4 pp. Available at vtforest.com.

Where not otherwise credited, images are from VT-FPR, including the Ron Kelley photo archive.



For more information, contact the Forest Biology Laboratory at 802-879-5687 or:	Windsor & Windham Counties.....	Springfield (802) 289-0613
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